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LAUNCH SERVICES PROGRAM

NASA LAUNCH SERVICES PROGRAM

DISCOVERY 2019 AO PRE-PROPOSAL CONFERENCE

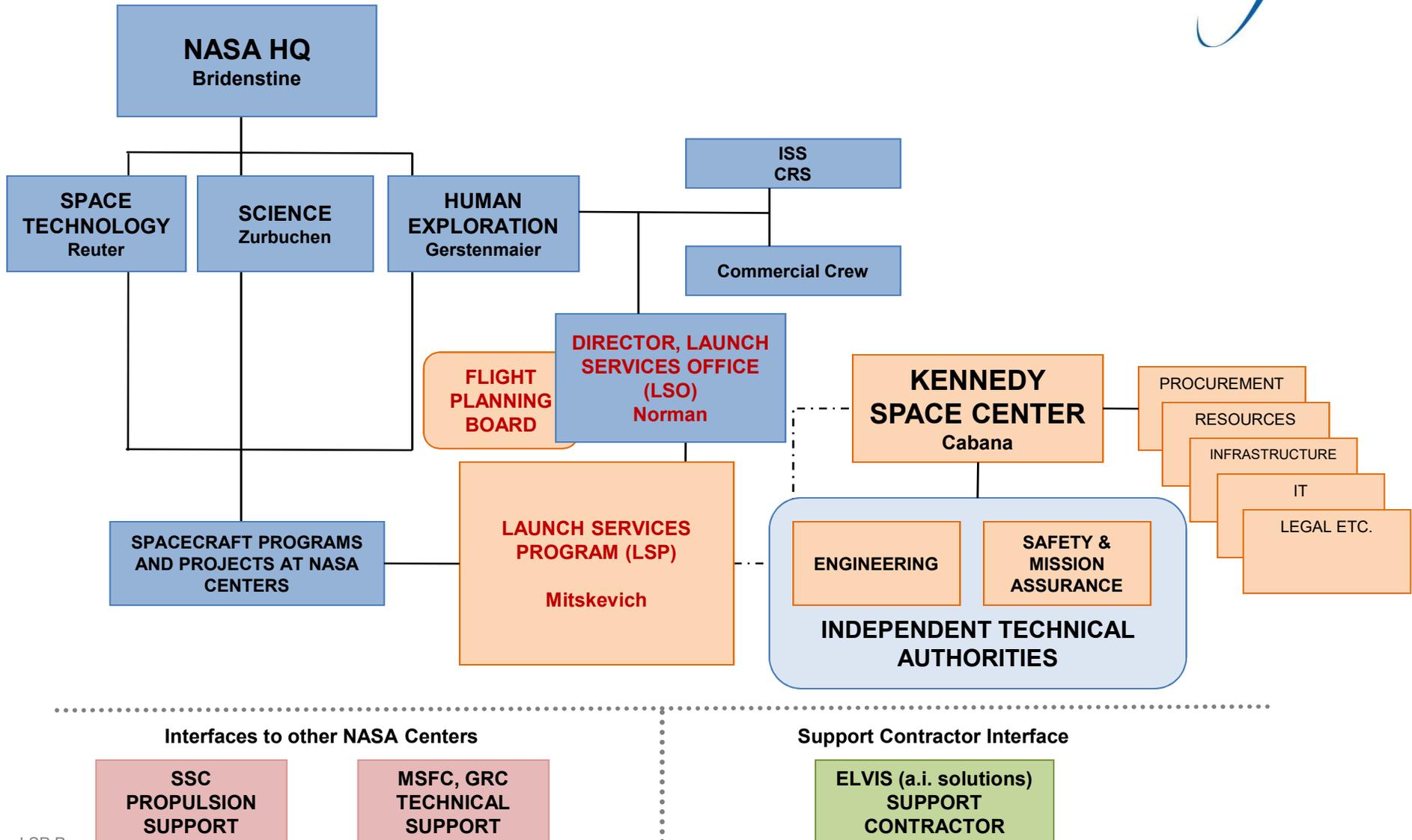
APRIL 26, 2019

Mary K. Faller
Flight Projects Office



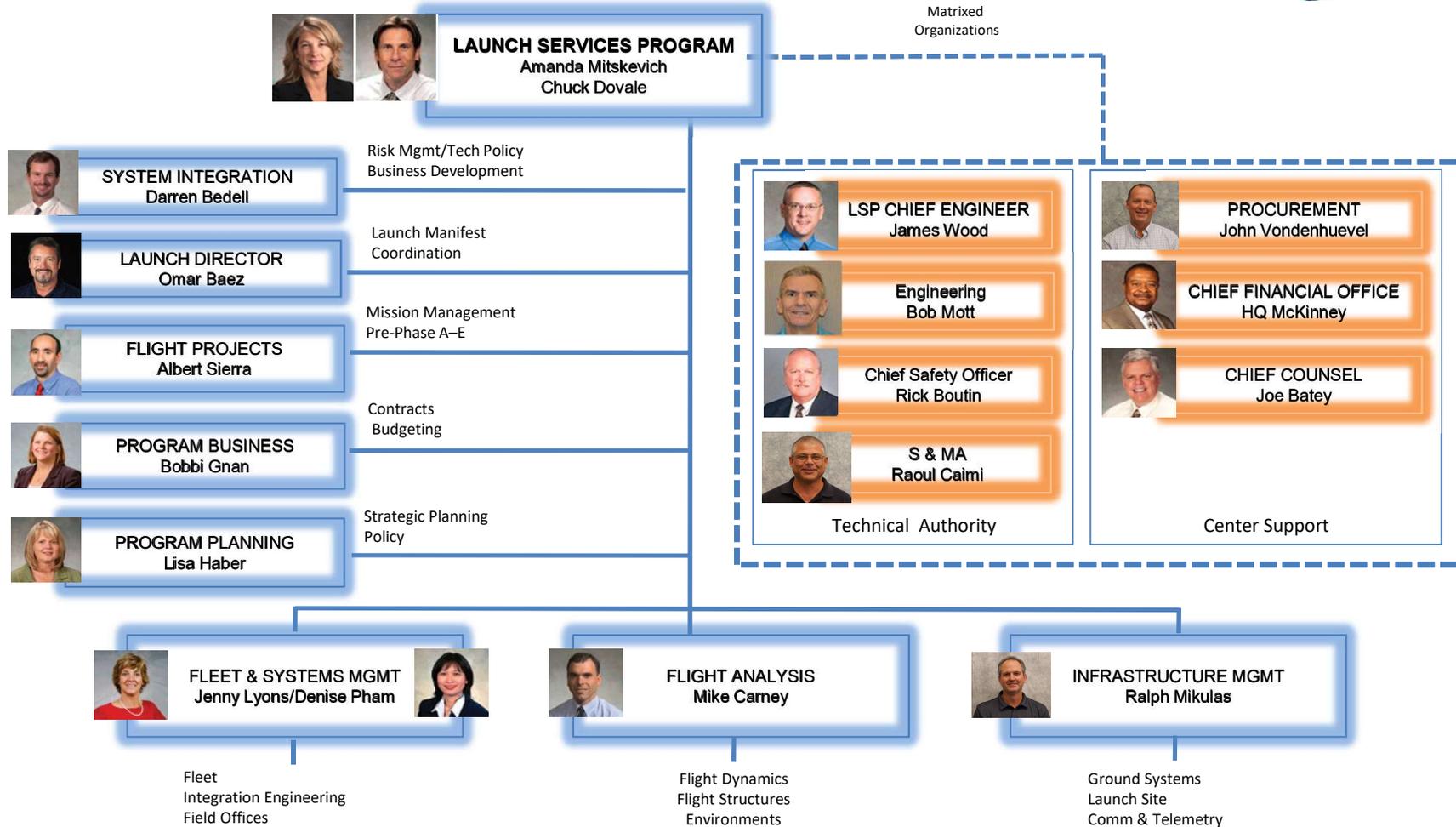
Launch Services Program Relationships (NASA/HEOMD/KSC)

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LSP Organizational Structure





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Launch Services Program



The Launch Services Program (LSP) provides:

- **Procurement and management of the launch service**
- **Technical insight/approval of the launch vehicle (LV) production/test**
 - **Mission Management and engineering support**
 - **Oversight (approval) of mission unique launch vehicle hardware/software development**
- **Launch campaign/countdown management – formal readiness reviews**
- **Risk management for launch service**
- **Downrange telemetry assets for launch vehicle data**



Launch Services Program



NASA Strategic Plan 2014

Strategic Goal 3:
Serve the American public and accomplish our Mission by effectively managing our people, technical capabilities, and infrastructure.



Objective 3.2:
Ensure the availability and continued advancement of strategic, technical, and programmatic capabilities to sustain NASA's Mission



Key Strategy:
Provide access to space

Lead Office: **HEOMD**
Contributing Program: **LSP**

Key Strategy "Provide access to space" citation:

"...certify and procure domestic commercial space transportation services for the launch of robotic science, communication, weather, and other civil sector missions"

"...provide robust, reliable, commercial and cost-effective launch services"

"...assured access to space through a competitive 'mixed Fleet' approach utilizing the breadth of U.S. industry's capabilities"



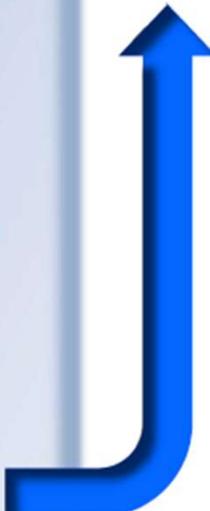
LSP Strategic Goals 2014

Goal 1: Maximize Mission Success

Goal 2: Assure Long-Term Launch Services

Goal 3: Promote Evolution of a U.S. Commercial Space Launch Market

Goal 4: Continually Enhance LSP's Core Capabilities





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LSP Functional Structure



- **LSP procures/provides a Launch Service**
 - Its more than the basic launch vehicle
 - We don't buy a tail number
 - This is a commercial firm fixed price procurement with additional insight and approval
- **To enable this, LSP has two functional sides**
 - **Mission integration**
 - » Mission Integration Team (MIT) assigned to each mission
 - » Manages mission specific procurement, integration, and analysis
 - » Includes launch site integration and processing
 - **Fleet management**
 - » Personnel assigned to each contracted rocket
 - » Includes resident offices within the production facilities of all active providers
 - » We watch the production and performance of entire fleet – we certify the manufacture's production line, not just a particular unit (tail number)
 - » We have a say in any change/upgrade/anomaly
- **LSP maintains the final go or no-go for launch**
- **Interface with Safety and Mission Assurance**
 - **Safety**
 - **Quality**



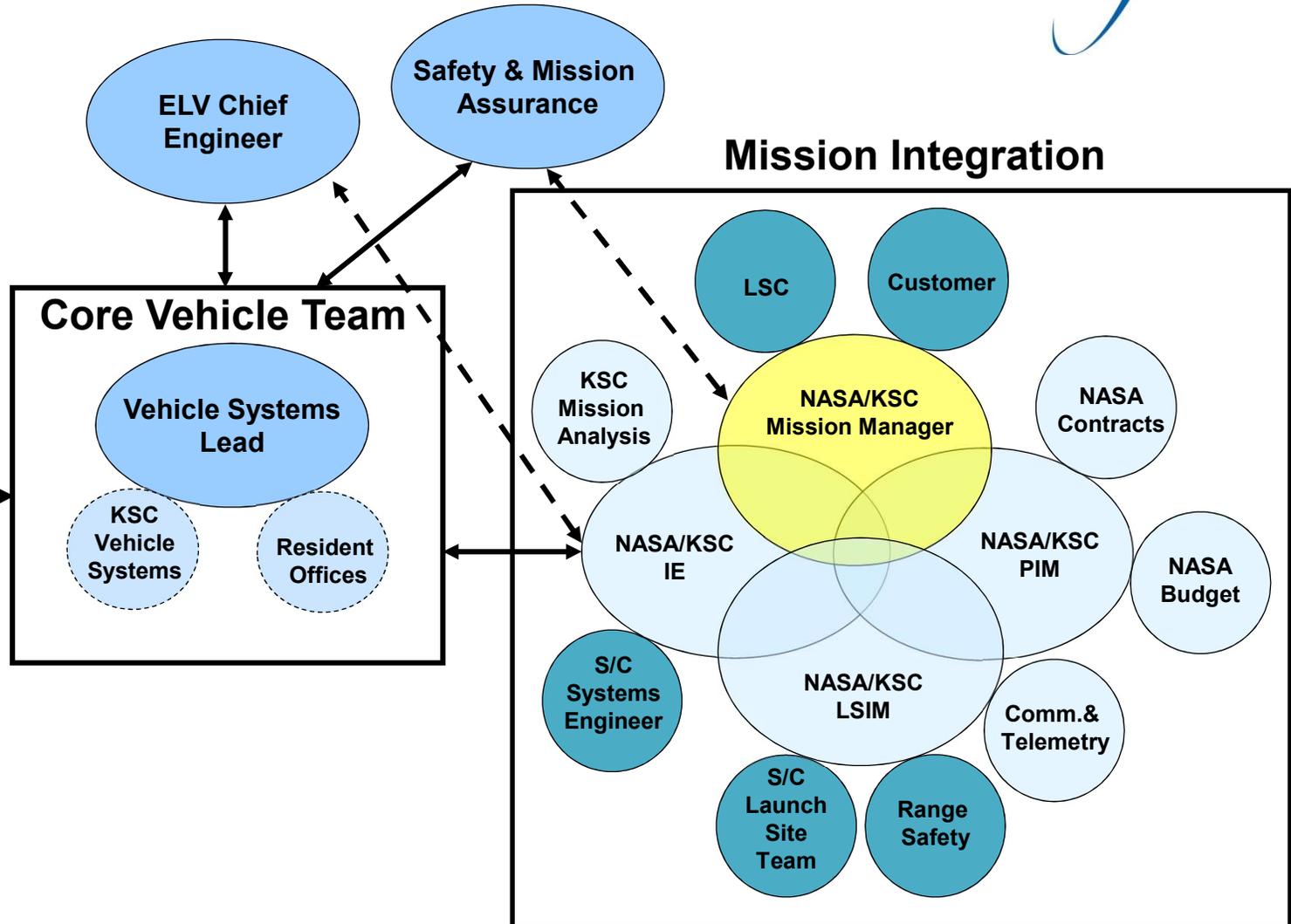
Technical Information flow into the MIT



Core Vehicle Test & Build

Integration & Test Facilities

Integrated Product Teams





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NASA Provided Launch Services



- **The NASA Launch Services (NLS) II Contract is LSP's primary method to acquire all classes of Category 2 and Category 3 commercial launch services for spacecraft (SC) customers (defined on page 9)**
- **Provides NASA with domestic launch services that are safe, successful, reliable, and affordable**
- **Provides services for both NASA-Owned and NASA-Sponsored payloads through multiple Indefinite Delivery Indefinite Quantity (IDIQ) Launch Service Task Order (LSTO) contracts with negotiated Not To Exceed (NTE) Prices**
- **Provides services on a Firm-Fixed-Price (FFP) basis**
 - Incorporates best commercial practices to the maximum extent practical
 - Includes standard and non-standard services
 - Mission unique modifications
 - Special studies
- **Allows LSP to turn on a task assignment or non-standard service at any time for analyses**



NLS II Contracts Overview



- **Launch Services Risk Mitigation Policy for NASA-owned and/or NASA-sponsored Payloads/Missions can be found under NPD 8610.7. Document can be found at <http://nodis3.gsfc.nasa.gov>**
 - Risk Category 1: Low complexity and/or low cost payloads-Classified as Class D payloads pursuant to NPR 8705.4
 - **Risk Category 2: Moderate complexity and/or moderate cost payloads-Classified as Class C payloads and, in some cases, Class B payloads, pursuant to NPR 8705.4**
 - Risk Category 3: Complex and/or high cost payloads-Classified as Class A payloads and, in some cases, Class B payloads, pursuant to NPR 8705.4
- **NLS II Launch Service Costs**
 - **Acquisition process begins at approximately L-36 months**
 - **Authority to Proceed (ATP) concurrent with task order award at approximately L-30 months (+/- 3 months)**
 - » Cumulative payment of 10% due at L-30 (Nominal)
 - » Nominal mission integration begins
 - **Costs not covered by the Discovery Program include items such as:**
 - » **Mission unique/non-standard services such as a custom/mission-specific payload adapters, auxiliary propulsion, extreme cleanliness/contamination sensitivities, launch services associated mission utilizing radioactive material (See Attachment 2 of the Launch Services Information Summary document)**
 - » **Payload-caused launch delay costs**



NLS II Contracts Overview



- **Each Provider has their own unique launch delay table**
 - **Delay terms are identical for both parties (contractor/NASA)**
 - **No-fault launch delays**
 - » **Include: range constraints, floods, acts of God, strikes and other conditions**
 - » **No adjustment made to mission price**
 - » **No limit on number of days**
- **For the remaining delay cases grace days are based on sliding scale for both contractor and NASA delays**
 - **150 days of grace at ATP through L-24**
 - **Sliding down to 7 days of grace at L-10 days**



Launch Service Budget



- **The standard launch service includes:**
 - **Procurement and management (including risk management) of the launch service, technical insight/approval of the launch vehicle production/test and mission unique launch vehicle hardware/software development**
 - » **Engineering, analysis, and minimum performance standards and services provided by the contract (insight and approval)**
 - **Launch vehicle (as a service)**
 - **Launch site payload processing facility and support, logistics, hazardous support**
 - **Range support and services, contractor engineering support, base support contracts**
 - **Down range telemetry support (launch vehicle only)**
 - **Launch campaign/countdown management – formal readiness reviews**
 - **Mission integration management**



Launch Service Budget (cont'd)



- **The standard launch service for this AO specifically includes:**
 - **Nominal allocation for non-standard/mission unique launch vehicle modifications/services – items typically necessary to customize the basic vehicle hardware to meet spacecraft driven requirements: T-0 GN2 purge, ISO 14644-1 Class 7 integration environment and interleaved SC telemetry – and mission unique reviews**
 - **Launch vehicle is categorized as a high performance launch vehicle with a 5-m payload fairing for a no later than Dec 31 2026 or Dec 31 2029 launch**
 - **Payload fairing with approximately two (2) nominal access doors with thermal and/or acoustic blankets (N/A to nuclear payloads)**
 - **Standard LV-provided payload separation system**
 - **Standard payload adapter (1194)**
 - **Standard test payload adapter availability**
 - **Spacecraft spin/de-spin capability for separation (if required)**
 - **Single-Spacecraft**
 - **Collision/contamination avoidance maneuver (CCAM) capability if needed**
 - **Electrical interface connectors (approximately 3 sets)**
- **Budget does not include launch delays**



Launch Services Budget (cont'd)



- **Non Standard launch services that are NOT covered under the LSP budget and cost must be included in the PI-managed mission cost (or adjusted cost cap):**
 - Nuclear launch services utilizing a RHU/MMRTG
 - Enhanced contamination control, planetary protection, operational clean enclosures
 - Cameras on the LV
 - Extended mission integration periods (in excess of 33 months)
 - LV hardware modifications required to accommodate unique payload configuration (e.g.1666 adapter)

- **Less capable launch vehicles or smaller fairings as shown:**

2026 Launch Readiness Date		
Performance Class	4m	5m
Low	+\$15M to Adjusted Cost Cap	+\$15M to Adjusted Cost Cap
Medium	N/A	+\$10M to Adjusted Cost Cap
Intermediate High	N/A	No Change to Cost Cap



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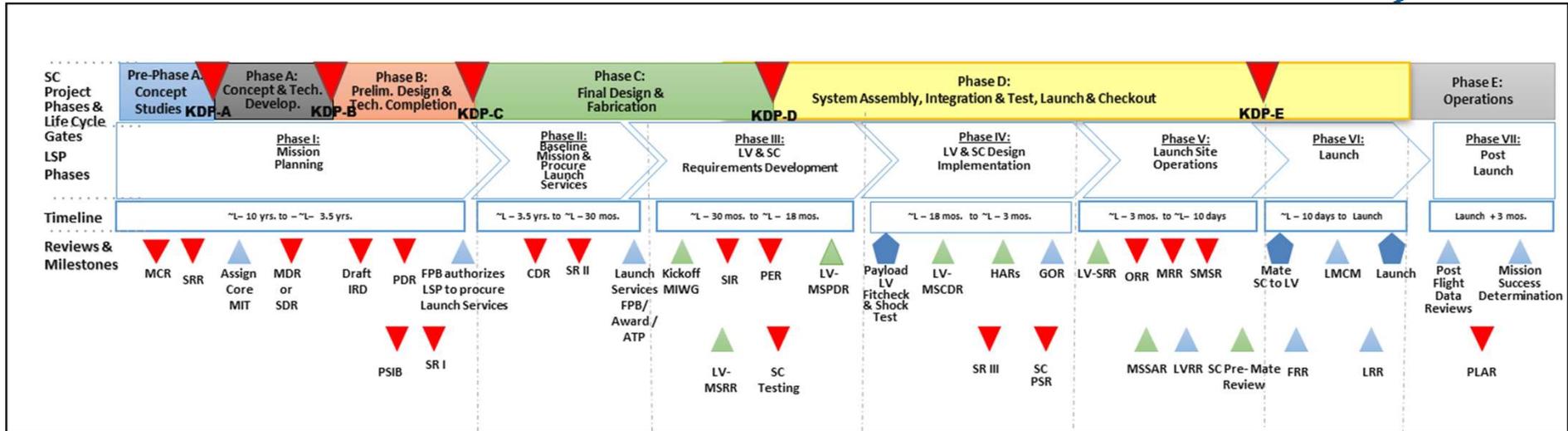
Launch Service Acquisition



- **The acquisition of the launch service will include a domestic launch vehicle procured and managed by the NASA/Launch Services Program (LSP)**
- **The LSP will competitively select a launch service provider for these missions based on customer requirements and NASA Flight Planning Board (FPB) approval**



Mission Life Cycle



Legend

- Spacecraft (Red Triangle)
- LSP (Blue Triangle)
- Launch Service Contractor (Green Triangle)
- Spacecraft & Launch Vehicle (Blue Pentagon)

ATP: Authority to Proceed
CDR: Critical Design Review
FPB: Flight Planning Board
FRR: Flight Readiness Review
GOR: Ground Operations Review
HAR: Hardware Acceptance Review
IRD: Interface Requirements Document
LMCM: Launch Management Coordination Meeting
LRR: Launch Readiness Review
LV-MSCDR: Launch Vehicle-Mission Specific Critical Design Review
LV-MSPDR: Launch Vehicle-Mission Specific Preliminary Design Review

LV-MSRR: Launch Vehicle-Mission System Requirements Review
LVRR: Launch Vehicle Readiness Review
LV-SRR: Launch Vehicle System Readiness Review
MCR: Mission Concept Review
MDR: Mission Definition Review
MIT: Mission Integration Team
MIWG: Mission Integration Working Group
MRR: Mission Readiness Review
MSSAR: Mission Specific Systems Acceptance Review
ORR: Operational Readiness Review

PDR: Preliminary Design Review
PER: Pre-Environmental Test Review
PLAR: Post-Launch Assessment Review
PSIB: Payload Safety Introduction Briefing
SC PSR: SC Pre-Ship Review
SDR: Systems Definition Review
SIR: System Integration Review
SMSR: Safety & Mission Success Review
SR (I-III): Safety Review
SRR: System Requirements Review



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Vehicles Projected to be Available Under NLS II



- **Most likely candidate vehicles for the Discovery AO that are projected to be available on the NLS II contract in the 2026/2029 timeframe are**
 - Antares 232
 - Falcon Heavy
 - Falcon 9
 - Vulcan
- **Assumption of a specific launch vehicle configuration as part of this AO proposal will not guarantee that the proposed LV configuration will be selected for award of a launch service competitive procurement**
- **Bidders must remain compatible with vehicles LSP is projecting to be available on the NLS II contract**
- **And, remain compatible with NLS II contractual capabilities and not rely on the launch vehicle providers users guides when determining LV configurations and performance**
 - **Proposers are advised to plan for compatibility with all that provide their performance requirements that are expected to be available through spacecraft Preliminary Design Review**
 - **Payload design should accommodate the limiting/enveloping launch characteristics and capabilities included in “Launch Services Information Summary” document**



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Launch Services Information Summary



- **Used to be called “ELV Launch Services Program Information Summary”**
 - **Removed the reference to “Expendable”**
 - **Now simply “Launch Services Information Summary”**
- **Initial Published 3/20/2019**
- **Correction to Figure 8 Legend published 3/22/2019 (color coding in legend did not match text and figure)**
- **Correction published 4/24/2019**
 - **Updated “Baseline” launch service performance class**
 - » **WAS: Medium Performance**
 - » **IS: High Performance**
 - **Updated discussion on how some additional cost items are handled in the PI budget**
 - » **WAS: All additional costs added to PI-MMC**
 - » **IS: Adjustments to cost cap for non-baseline launch services and nuclear missions.**
 - » **All other unique requirements should be accounted for in the PI-MMC**
 - **Editorial**



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Summary



- **It is the Launch Services Program's goal to ensure the highest practicable probability of mission success while managing the launch service technical capabilities, budget and schedule**
- **Questions must be officially submitted to:**

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NASA Launch Services Program

Code VA-C

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Back Up



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Available Vehicles under NLS II



- **The Agency policy, NPD 8610.7, “Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Mission”**
 - **Requires one successful launch of vehicle configuration in order to bid for a proposal**
- **Launch Services Program initiates the procurement of a launch service under the NLS II contract via a Launch Services Task Order (LSTO)**



LSTO Process



- **HQ Flight Planning Board (FPB) notifies LSP of mission requirement**
 - **Launch Services Interface Requirements Document (LSIRD) has already been developed by SC customer & provided to HQ FPB and to LSP (LSP works with SC customer to develop LSIRD)**
- **Launch Services Program Manager notifies procurement officer of requirement and provides recommended technical personnel for LSTO evaluation team**
- **Procurement officer establishes LSTO evaluation team with designated contracting officer and lead tech evaluator**
 - **Note that the team includes up to 2 or 3 reps from the spacecraft project team**
- **LSTO evaluation team performs the following:**
 - **Develop tech requirements based on mission definition**
 - **Assures FAR guidelines are being followed**
 - **Determines and documents LSTO evaluation criteria**
 - **CO issues Request for Launch Services Proposal (RLSP) to multiple contractors**



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LSTO Process



- **LSTO evaluation team performs the following (cont'd):**
 - Evaluate contractor proposals in accordance with LSTO procedures
 - Complete evaluation and brief to procurement officer, LSP Program Manager, FPB, sponsoring Program/Project on evaluation results
 - Verify status of Authority To Proceed (ATP)
- **Launch Services Program Manager makes selection and coordinates with KSC Contracting Officer (CO)**
- **KSC CO awards LSTO for mission launch service**



Evaluation



Launch Service Risk Evaluation:

Overall Assessment: - Given the ground rules in the AO, is the proposed launch vehicle (LV), standard services, mission unique services, performance class, costs and concept feasible for this application? (Yes or No)

Areas of risk: _____

LV Performance Summary: Area of risk? (Yes or No

Proposed Launch Date: _____

Launch Period (MM/DD/YYYY to MM/DD/YYYY): ____/____/____ to ____/____/____

Launch Window (On any given day of the launch period Minutes:Seconds): _____ : _____

Orbit requirements: Apogee: _____ km Perigee: _____ km Inclination _____ deg.

High Energy requirements: C3: _____ km²/sec² DLA: _____ deg RLA: _____ deg

AO Baseline Performance Class (5-m High)? (Yes or No)

If not, Proposed Performance Class (4-m, 5-m Low/Medium)?: _____

CBE Launch Mass (including reserves Wet Mass: _____ kg

NTE Launch Mass (including reserves) Wet Mass: _____ kg

Launch Mass Margin _____ kg _____ %

Formulas:

Mass Margin kg = LV Performance – S/C Mass (including reserves)

Mass Margin % = [(Mass Margin kg)/ S/C Mass (including reserves) kg] X 100

Does candidate launch vehicles have adequate performance for the proposed mission? (Yes or No)

LV Performance Risks: _____



Evaluation (cont'd)



LV to Spacecraft Interface Summary: Area of risk? (Yes or No)

Payload Fairing (PLF) Interfaces and Access:

Spacecraft (S/C) Dimensions: Radial: _____ m Height _____ m

Any intrusions outside of the AO Baseline PLF usable STATIC volume for the given performance class? (Yes or No)

If so, list risks: _____

Are there any special access requirements post-fairing encapsulation? (Yes or No)

If so, list risks: _____

Mechanical Interface:

Is the AO Baseline Adapter (1194) proposed? (Yes or No)

If not, list risks: _____

Electrical Interface:

Are there unique electrical interfaces proposed? (Yes or No)

If so, list risks: _____

Mission Unique or Non-Standard Requirements Proposed:

List of Mission Unique Non-Standard Services proposed that are not part of the AO Baseline launch service offered:

Planetary Protection Requirements: _____

Unique launch or processing Facility Requirements (not yet approved): _____

List Radiological Sources (if applicable): _____

Are facilities, not already approved for use, required to store/process the Radiological Sources? (Yes or No)

Are any LV modifications not included in the AO Baseline service required for additional safety or Launch approval?
(Yes or No)



Evaluation (cont'd)



Launch Service Budget Assessment Summary: Area of risk? (Yes or No)

Are the additional Mission Unique or Non-standard Services not included in the AO Baseline service covered by mission flex funding allocated by LSP? (Yes or No)

If not, list risks: _____

Has additional funding been identified in the PI-Managed Mission Cost (PI-MMC)? (Yes or No)

If not, list risks: _____

S/C Schedule Summary: Area of risk? (Yes or No)

Launch Service Integration time 30+/-3 months? (Yes or No)

SC Environmental Test program end date L- _____ mo

Delivery of verified SC loads model delivery to LSP at L-10 months or earlier? (Yes or No)

SC Ship date L- _____ mo

SC to LV integrated operations L- _____ days

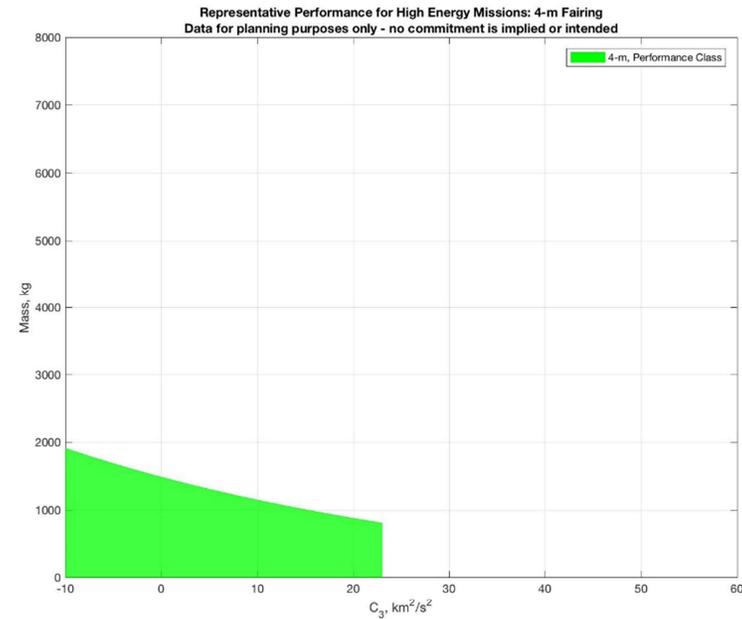
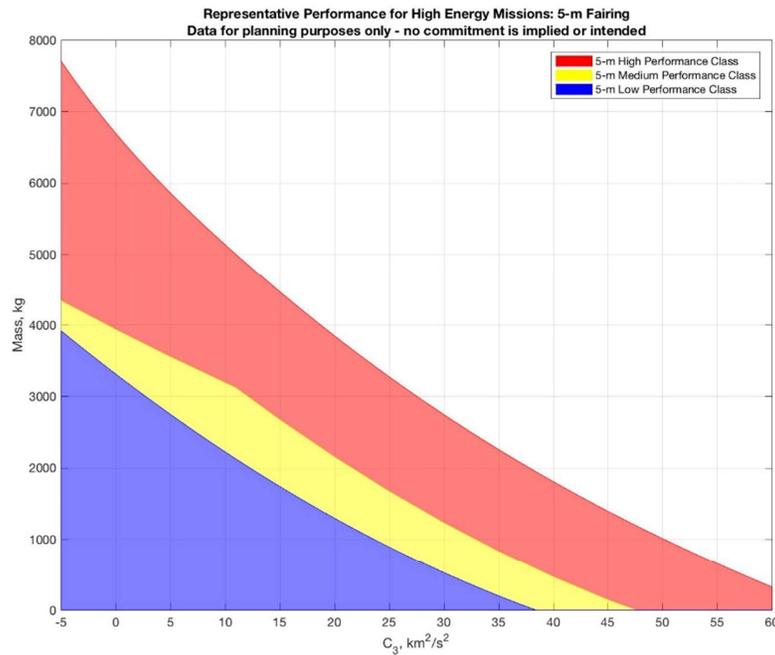
Describe risk of missing the proposed launch date due to spacecraft schedule (environmental testing, launch processing, LV integration): _____

Other identified cost, technical, schedule risks?: Area of risk? (Yes or No)

List Risks:



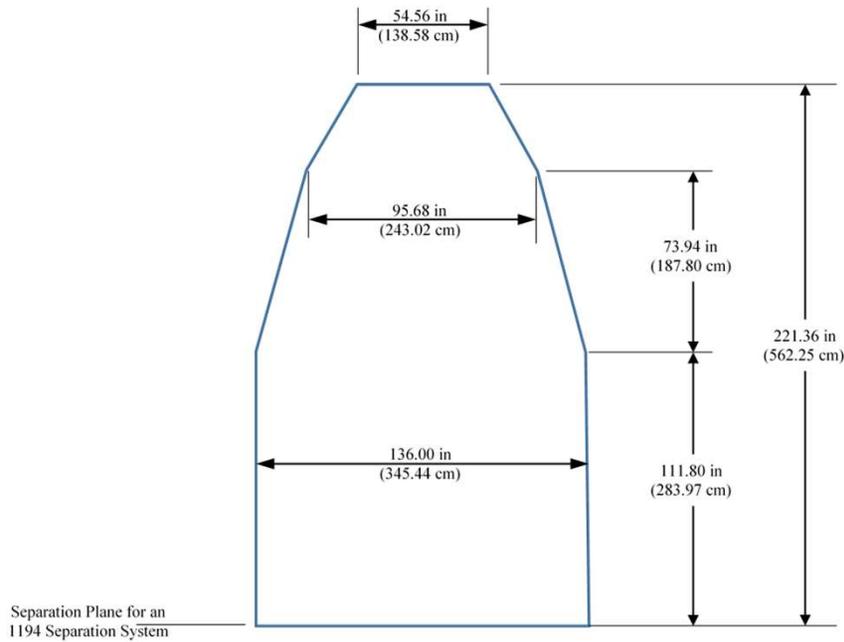
Launch Services Characteristics/Capabilities



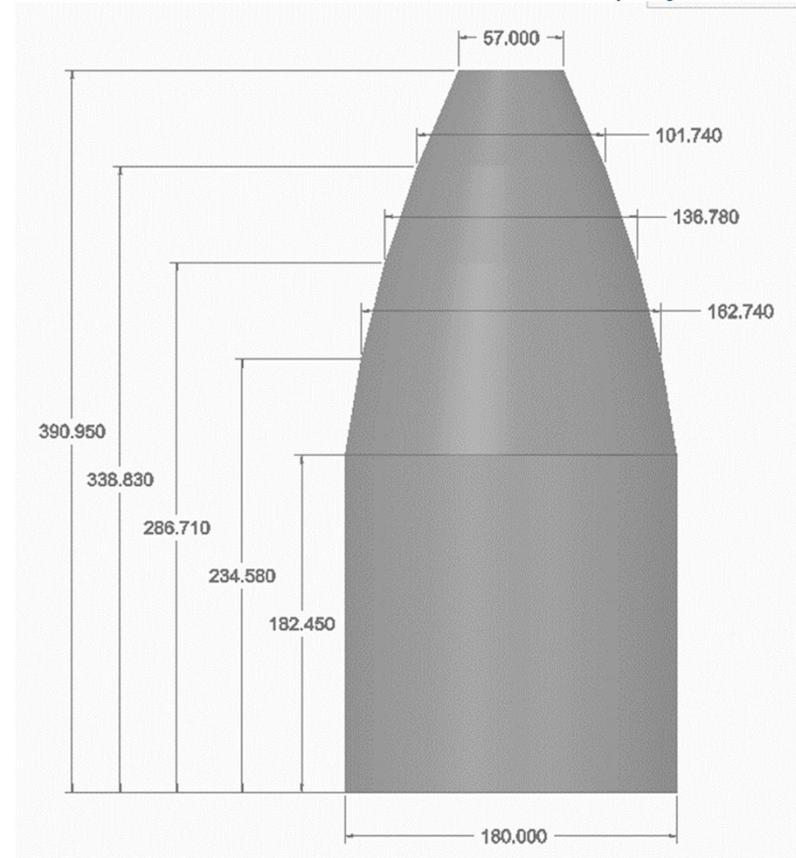
Appropriate fairing must be used for each performance class



Payload Fairings (not to scale)



4m Static Payload Firing Envelope



**5m Static Payload Firing Envelope
(Low, Medium and High Performance Class)**